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Special Provision for Quality Control/Quality Assurance of Concrete Mixtures

January 11, 2002

This special provision has been revised to remove the pay item QC/QA Concrete and make the work included in the various concrete contract items. Minor corrections and clarifications have been made as well.

This special provision should be inserted into contracts, as directed by the District, where the Department would not perform quality control at the plant or jobsite.

The districts should include the BDE Check Sheet marked with the applicable special provisions for the April 26, 2002 and subsequent lettings. The Project Development and Implementation Section will include the paper copy in the contract.

This special provision will be transferred through the E-mail System to the district offices on January 11, 2002.

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QUALITY CONTROL/QUALITY ASSURANCE OF CONCRETE MIXTURES (BDE)

Effective: April 1, 1992
Revised: January 1, 2002

Description. This special provision specifies the quality control responsibilities of the Contractor, for portland cement concrete mixtures, cement aggregate mixture II, and controlled low-strength material incorporated in the project, and defines the quality assurance and acceptance responsibilities of the Engineer.

The Contractor, by application for and receipt of prequalification, by submission of a bid and if awarded the contract, by execution of the contract containing this special provision, certifies that he/she: fully and thoroughly understands all aspects and requirements of this special provision; possesses the latest edition of and thoroughly understands all aspects and requirements of the procedures, manuals and documents referred to and incorporated by reference in this special provision; and waives and releases any and all claims of misunderstanding or lack of knowledge of the same. Furthermore, the Contractor understands and agrees that compliance with the requirements of this special provision and the Quality Control Plan approved by the Engineer is an essential element of the contract. Failure to comply with these requirements can result in one or more of the following: a major breach of this contract and default thereof, a loss of prequalification and a suspension of the Contractor from bidding.

A list of quality control/quality assurance (QC/QA) documents is provided in Schedule D.

Materials. For concrete, aggregates (except finely divided minerals) shall be produced according to the Department's Policy Memorandum “Aggregate Gradation Control System”. Gradations other than those in the Standard Specifications may be used if produced according to the Department's “Aggregate Gradation Control System”.

For controlled low-strength material, the Department’s “Aggregate Gradation Control System” will not apply.

Equipment/Laboratory. The Contractor shall provide a laboratory and test equipment to perform their quality control testing.

The laboratory shall be of sufficient size and be furnished with the necessary equipment, supplies, and current published test methods for adequately and safely performing all required tests. The laboratory will be approved by the Engineer at the beginning of each construction season or each 12 month period. Production of a mixture shall not begin until the Engineer provides written approval of the laboratory. The Contractor shall refer to the Department's "Required Sampling and Testing Equipment for Concrete" for equipment requirements.

Test equipment shall be maintained and calibrated as required by the appropriate test method, and when required by the Engineer. This information shall be documented on the Department's "Calibration of Concrete Testing Equipment" form.

Test equipment used to determine compressive or flexural strength shall be calibrated each 12 month period by an independent agency, using calibration equipment traceable to the National Institute of Standards and Technology (NIST). The Contractor shall have the calibration documentation available at the test equipment location.

The Engineer will have unrestricted access to the plant and laboratory at any time to inspect measuring and testing equipment, and will notify the Contractor of any deficiencies. Defective equipment shall be immediately repaired or replaced by the Contractor.

Plant/Delivery Trucks. The concrete plant and delivery trucks shall be approved according to the Department's Policy Memorandum "Approval of Concrete Plants and Delivery Trucks."

Quality Control Plan. The Contractor shall submit, in writing, a proposed Quality Control (QC) Plan to the Engineer. The QC Plan shall be submitted a minimum of 45 calendar days prior to the production of a mixture. The QC Plan shall address the quality control of the concrete, cement aggregate mixture II, and controlled low-strength material incorporated in the project. The Contractor shall refer to the Department's "Model Quality Control Plan for Concrete Production" to prepare a QC Plan. The Engineer will respond in writing to the Contractor's proposed QC Plan within 15 calendar days of receipt.

Production of a mixture shall not begin until the Engineer provides written approval of the QC Plan. The approved QC Plan shall become a part of the contract between the Department and the Contractor, but shall not be construed as acceptance of any mixture produced.

The QC Plan may be amended during the progress of the work, by either party, subject to mutual agreement. The Engineer will respond in writing to a Contractor's proposed QC Plan amendment within 15 calendar days of receipt. The response will indicate the approval or denial of the Contractor's proposed QC Plan amendment.

Mix Design Requirements. The Contractor shall provide the concrete, cement aggregate mixture II, and controlled low-strength material mix designs to the Engineer, a minimum of 45 calendar days prior to production. The mix design shall meet all the criteria specified in the contract. More than one mix design may be submitted for each class or use. The Department's "Manual of Instructions for Design of Concrete Mixtures", the design method for cement aggregate mixture II according to Article 312.31 of the Standard Specifications, or other methods may be used to provide a mix design.

The Contractor may request to use a concrete, cement aggregate mixture II, or controlled low-strength material mix design previously verified by the Engineer. The Engineer will review the mix design from the Department's historical test data for verification.

The Contractor may request to use a new concrete or cement aggregate mixture II mix design. The Contractor shall provide the following: the source of all materials; the gradation of fine and coarse aggregates; the absolute volumes, specific gravities, unit weights, water/cement ratio, mortar factor, and any other values used in the mix design process; the type and proposed

dosage of admixtures; and the target slump, air content and strength for the new mix design. The new mix design will be evaluated for verification from test information provided by the Contractor, testing performed by the Department, and other criteria determined by the Engineer. The Contractor will be notified in writing upon verification of the new mix design by the Engineer.

The Contractor may request to use a new controlled low-strength material mix design. The required mix design information, evaluation, and verification shall be according to the controlled low-strength material specification.

Verification of a concrete, cement aggregate mixture II, or controlled low-strength material mix design shall in no manner be construed as acceptance of any mixture produced. The Engineer shall be notified in writing of any proposed changes, subsequent to verification of a mix design.

Tests performed at the jobsite will determine if a concrete, cement aggregate mixture II, or controlled low-strength material mix design can meet specifications. The Contractor shall make adjustments to a mix design, or submit a new mix design if necessary, to comply with the specifications.

For any concrete mix design method selected, a new mix design will be required if the mortar factor changes ± 0.05 or more from its original value, or if it exceeds the maximum value in Article 1020.05(d). For the Department's concrete mix design method, a new mix design will also be required when the mortar factor exceeds the specified limits. The mortar factor limits for the Department's mix design method are specified in the most current edition of the "Portland Cement Concrete Level II Technician Course" manual, effective on the date of advertisement for bids.

(a) Concrete Strength Test Data. If the Contractor requests to use a new concrete mix design, strength test data shall be provided to the Engineer.

Upon review of the strength test data provided by the Contractor, the Engineer may request the Contractor to provide a trial mixture. The trial mixture shall be performed in the presence of the Engineer, and the Engineer will perform all tests. The volume of the trial mixture shall be a minimum of 0.76 cu m (1 cu yd). For the trial mixture, the slump shall be within 15 mm (1/2 inch) and the air content within 1.0 percent of the mix design target values. Strength will be determined at 3, 7 and 14 days, or at other days determined by the Engineer. Strength will be determined as the average of a minimum of 3 cylinder breaks. Testing will be performed according to Illinois Modified AASHTO T 22, T 23, T 119, T 141, and T 152 or T 196.

(b) Concrete Durability Test Data. If the Contractor requests to use a new concrete mix design, durability test data may be required by the Engineer. Durability test data may be necessary because of a new material source, the gradation of aggregates, the proposed proportioning of materials, the proposed mortar factor, or other criteria determined by the Engineer. Durability tests shall be performed by an independent laboratory regularly inspected by the Cement and Concrete Reference Laboratory (CCRL) of the National

Institute of Standards and Technology (NIST). Durability test data shall consist of the following:

(1) The new concrete mix design shall be tested according to AASHTO T 161, Procedure A or B. When measuring the test specimens, a temperature of 23 ± 1 °C (73 ± 1 °F) shall be used. The new concrete mix design shall have a relative dynamic modulus of elasticity which is 80 percent of the initial modulus, after 300 cycles.

(2) The new concrete mix design shall be tested according to Illinois Modified ASTM C 672.

(c) Cement Aggregate Mixture II Test Data. If the Contractor requests to use a new cement aggregate mixture II mix design, durability test data shall be provided to the Engineer. The durability test shall be performed by an independent laboratory regularly inspected by CCRL of NIST. The new cement aggregate mixture II mix design shall be tested according to AASHTO T 161, Procedure A or B. When measuring the test specimens, a temperature of 23 ± 1 °C (73 ± 1 °F) shall be used. The new cement aggregate mixture II mix design shall have a relative dynamic modulus of elasticity which is 80 percent of the initial modulus, after 100 cycles.

Quality Control by Contractor. The Contractor shall perform quality control inspection, sampling, testing, and documentation to meet contract requirements. Quality control includes the recognition of obvious defects and their immediate correction. Quality control also includes appropriate action when passing test results are near specification limits. Quality control may require increased testing, communication of test results to the plant or the jobsite, modification of operations, suspension of mixture production, rejection of material, or other actions as appropriate. The Engineer shall be immediately notified of any failing tests and subsequent remedial action. Passing tests shall be reported no later than the start of the next work day.

When a mixture does not comply with specifications, the Contractor shall reject the material; unless the Engineer accepts the material for incorporation in the work, according to Article 105.03.

(a) Personnel Requirements. The Contractor shall provide a Quality Control (QC) Manager who will have overall responsibility and authority for quality control. The Contractor shall provide sufficient personnel to perform the required inspections, sampling, testing and documentation in a timely manner. The Contractor shall refer to the Department's "Qualifications and Duties of Concrete Quality Control Personnel" document.

A Level I PCC Technician shall be provided at the jobsite during mixture production and placement, and may supervise concurrent pours on the project. For concurrent pours, a minimum of one Concrete Tester shall be required at each pour location. If the Level I PCC Technician is at one of the pour locations, a Concrete Tester is still required at the same location. Each Concrete Tester shall be able to contact the Level I PCC Technician by cellular phone, two-way radio or other methods approved by the

Engineer. A single Level I PCC Technician shall not supervise concurrent pours for multiple contracts.

A Level II PCC Technician shall be provided at the plant, or shall be available, during mixture production and placement. A Level II PCC Technician may supervise a maximum of three plants. Whenever the Level II PCC Technician is not at the plant during mixture production and placement, a Concrete Tester or Level I PCC Technician shall be present at the plant to perform any necessary concrete tests. The Concrete Tester, Level I PCC Technician, or other individual shall also be trained to perform any necessary aggregate moisture tests, if the Level II PCC Technician is not at the plant during mixture production and placement. The Concrete Tester, Level I PCC Technician, plant personnel, and jobsite personnel shall have the ability to contact the Level II PCC Technician by cellular phone, two-way radio, or other methods approved by the Engineer.

For a mixture which is produced and placed with a mobile portland cement concrete plant as defined in Article 1103.04 of the Standard Specifications, a Level II PCC Technician shall be provided. The Level II PCC Technician shall be present at all times during mixture production and placement.

A Concrete Tester, Mixture Aggregate Technician, and Aggregate Technician may provide assistance with sampling and testing. A Gradation Technician may provide assistance with testing. A Concrete Tester shall be supervised by a Level I or Level II PCC Technician. A Gradation Technician shall be supervised by a Level II PCC Technician, Mixture Aggregate Technician, or Aggregate Technician.

(b) Required Plant Tests. Sampling and testing shall be performed at the plant, or at a location approved by the Engineer, to control the production of a mixture. The required minimum Contractor plant sampling and testing is indicated in Schedule A.

(c) Required Field Tests. Sampling and testing shall be performed at the jobsite to control the production of a mixture, and to comply with specifications for placement. For standard curing, after initial curing, and for strength testing; the location shall be approved by the Engineer. The required minimum Contractor jobsite sampling and testing is indicated in Schedule B.

Quality Assurance by Engineer. The Engineer will perform quality assurance tests on independent samples and split samples. An independent sample is a field sample obtained and tested by only one party. A split sample is one of two equal portions of a field sample, where two parties each receive one portion for testing. The Engineer may request the Contractor to obtain a split sample. Aggregate split samples shall be retained until permission is given by the Engineer for disposal. The results of all quality assurance tests by the Engineer will be made available to the Contractor as soon as they are completed. The Engineer's quality assurance independent sample and split sample testing is indicated in Schedule C.

(a) Strength Testing. For strength testing, Article 1020.09 shall apply, except the Department may provide its own curing facilities for curing cylinder strength specimens. For beam strength specimens cured in a water storage tank at the jobsite, the Contractor and Engineer strength specimens may be cured in the same tank.

(b) Comparing Test Results. Differences between the Engineer's and the Contractor's split sample test results will not be considered extreme if within the following limits:

Test Parameter	Acceptable Limits of Precision
Slump	20 mm (0.75 in.)
Air Content	0.9 percent
Compressive Strength	6200 kPa (900 psi)
Flexural Strength	620 kPa (90 psi)
Aggregate Gradation	See "Guideline for Sample Comparison" in Appendix "A" of the Manual of Test Procedures for Materials.

(c) Test Results. If either the Engineer's or the Contractor's split sample test result is not within specification limits, and the other party is within specification limits; immediate retests on a split sample shall be performed for slump, air content, or aggregate gradation. A passing retest result by each party will require no further action. If either the Engineer's or Contractor's slump, air content, or aggregate gradation split sample retest result is a failure; or if either the Engineer's or Contractor's strength test result is a failure, and the other party is within specification limits; the following actions shall be initiated:

(1) The Engineer and the Contractor shall investigate the sampling method, test procedure, equipment condition, equipment calibration, and other factors.

(2) The Engineer or the Contractor shall replace test equipment, as determined by the Engineer.

(3) The Engineer and the Contractor shall perform additional testing on split samples, as determined by the Engineer.

(4) For aggregate gradation, jobsite slump, and jobsite air content; if the failing test result is not resolved according to (1), (2), or (3), and the mixture has not been placed, the Contractor shall reject the material; unless the Engineer accepts the material for incorporation in the work according to Article 105.03.

For aggregate gradation, jobsite slump, and jobsite air content; if the result of a quality assurance test on a sample independently obtained by the Engineer is not within specification limits, and the mixture has not been placed, the Contractor shall reject the material, unless the Engineer accepts the material for incorporation in the work according to Article 105.03.

If a continued trend of difference exists between the Engineer's and the Contractor's split sample test results, or if split sample test results exceed the acceptable limits of precision, the Engineer and the Contractor shall investigate. The investigation shall be according to (1), (2) and (3).

Acceptance by the Engineer. Final acceptance will be based on the Standard Specifications and the following:

(a) The Contractor's compliance with all contract documents for quality control.

(b) Validation of Contractor quality control test results by comparison with the Engineer's quality assurance test results using split samples.

(c) Comparison of the Engineer's quality assurance test results with specification limits using samples independently obtained by the Engineer.

The Engineer may suspend mixture production, reject materials, or take other appropriate action if the Contractor does not control the quality of concrete, cement aggregate mixture II, or controlled low-strength material for acceptance. The decision will be determined according to (a), (b), and (c).

Documentation.

(a) Records. The Contractor shall be responsible for documenting all observations, inspections, adjustments to the mix design, test results, retest results, and corrective actions in a bound hardback field book, bound hardback diary, or appropriate Department form, which shall become the property of the Department. The documentation shall include a method to compare the Engineer's test results with the Contractor's results. The Contractor shall be responsible for the maintenance of all permanent records whether obtained by the Contractor, the consultants, the subcontractors, or the producer of the mixture. The Contractor shall provide the Engineer full access to all documentation throughout the progress of the work.

The Department's form MI 504 M, form MI 654, and form MI 655 shall be completed by the Contractor, and shall be submitted to the Engineer weekly or as required by the Engineer. A correctly completed form MI 504 M, form MI 654, and form MI 655 are required to authorize payment by the Engineer, for applicable pay items.

(b) Delivery Truck Ticket. For a mixture which is not mixed on the jobsite, a delivery ticket shall be required for each load.

The following information shall be recorded on each delivery ticket: ticket number, name of producer, contract number, name of Contractor, date, time batched, truck number, quantity batched, and Department mix design number.

The following information shall be recorded on each delivery ticket or in a bound hardback field book: initial/final revolution counter reading, at the jobsite, if the mixture is truck-mixed; time discharged at the jobsite; total amount of each admixture in batch; total amount of water added at the jobsite; and total amount of water in batch.

Basis of Payment. Quality Control/Quality Assurance of portland cement concrete mixtures will not be paid for separately, but shall be considered as included in the cost of the various concrete contract items.

SCHEDULE A
CONTRACTOR PLANT SAMPLING AND TESTING

ITEM	TEST	FREQUENCY	IL MODIFIED AASHTO, IL MODIFIED ASTM, OR DEPARTMENT TEST METHOD (a)
Aggregates (Arriving at Plant)	Gradation (b)	As needed to check source for each gradation number	T 2, T 11, T 27 and T 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Gradation (b)	1,900 cu m (c) (2,500 cu yd) for each gradation number	T 2, T 11, T 27 and T 248
Aggregates (Stored at Plant in Stockpiles or Bins)	Moisture (d): Fine Aggregate	Once per week for moisture sensor, otherwise daily for each gradation number	Flask, Dunagan, Pychnometer Jar, or T 255
	Coarse Aggregate	As needed to control production for each gradation number	Dunagan, Pychnometer Jar, or T 255
Mixture (e)	Slump Air Content Unit Weight/ Yield Temperature	As needed to control production	T 141 and T 119 T 141, and T 152 or T 196 T 141 and T 121 T 141 and ASTM C 1064

Notes: (a) Refer to the Department's "Manual of Test Procedures for Materials".

(b) The first test and every third test thereafter shall be washed. Testing shall be completed no later than 24 hours after the aggregate has been sampled.

(c) One per week (Sunday through Saturday) minimum. One per day minimum if pouring bridge deck.

(d) If the moisture test and moisture sensor disagree by more than 0.5%, retest. If the difference remains, adjust the moisture sensor to an average of two or more moisture tests, using the Dunagan or Illinois Modified AASHTO T 255 test method.
The Department's "Water/Cement Ratio Worksheet" form shall be completed when applicable.

(e) The Contractor may also perform strength testing according to Illinois Modified AASHTO T 141, T 23, and T 22 or T 177; or water content testing according to Illinois Modified AASHTO TP23; or other tests at the plant to control mixture production.

SCHEDULE B

CONTRACTOR JOBSITE SAMPLING & TESTING (a)

ITEM	MEASURED PROPERTY	RANDOM SAMPLE TESTING FREQUENCY PER MIX DESIGN AND PER PLANT (b)	ILLINOIS MODIFIED AASHTO TEST METHOD
PAVEMENT, SHOULDER, BASE COURSE, WIDENING, BRIDGE APPROACH PAVEMENT, DRIVEWAY PAVEMENT, RAILROAD CROSSING, CEMENT AGGREGATE MIXTURE II.	SLUMP (c) (d)	1 per 400 cu m (500 cu yd) or Minimum 1/Day	T 141, and T 119
	AIR CONTENT (c) (e) (f)	1 per 80 cu m (100 cu yd) or Minimum 1/Day	T 141, and T 152 or T 196
	COMPRESSIVE STRENGTH (g) (h) or FLEXURAL STRENGTH (g) (h)	1 per 1000 cu m (1250 cu yd) or Minimum 1/Day	T 141, T 22 , and T 23, or T 141, T 177, and T 23
BRIDGE DECK (i), BRIDGE DECK OVERLAY (i), SUPERSTRUCTURE (i), SUBSTRUCTURE, CULVERT, MISCELLANEOUS DRAINAGE STRUCTURES, RETAINING WALL, BUILDING WALL, FOOTING, LIGHT FOUNDATION, TRAFFIC FOUNDATION, PAVEMENT PATCHING, STRUCTURAL REPAIRS.	SLUMP (c) (d)	1 per 40 cu m (50 cu yd) or Minimum 1/Day	T 141, and T 119
	AIR CONTENT (c) (e) (f)	1 per 40 cu m (50 cu yd) or Minimum 1/Day	T 141, and T 152 or T 196
	COMPRESSIVE STRENGTH (g) (h) or FLEXURAL STRENGTH (g) (h)	1 per 200 cu m (250 cu yd) or Minimum 1/Day	T 141, T 22 , and T 23, or T 141, T 177, and T 23

SCHEDULE B -(continued)

ITEM	MEASURED PROPERTY	RANDOM SAMPLE TESTING FREQUENCY PER MIX DESIGN AND PER PLANT (b)	ILLINOIS MODIFIED AASHTO OR ILLINOIS MODIFIED ASTM TEST METHOD
CAISSON, CAST-IN-PLACE PILE, SEAL COAT (j)	COMPRESSIVE STRENGTH (g) (h) or FLEXURAL STRENGTH (g) (h)	1 per 200 cu m (250 cu yd) or Minimum 1/Day	T 141, T 22, and T 23, or T 141, T 177, and T 23
CURB, GUTTER, MEDIAN, BARRIER, SIDEWALK, SLOPE WALL, PAVED DITCH, FABRIC FORMED CONCRETE REVETMENT MAT (k) MISCELLANEOUS ITEMS, INCIDENTAL ITEMS.	SLUMP (c) (d)	1 per 80 cu m (100 cu yd) or Minimum 1/Day	T 141, and T 119
	AIR CONTENT (c) (e) (f)	1 per 40 cu m (50 cu yd) or Minimum 1/Day	T 141, and T 152 or T 196
	COMPRESSIVE STRENGTH (g) (h) or FLEXURAL STRENGTH (g) (h)	1 per 300 cu m (400 cu yd) or Minimum 1/Day	T 141, T 22, and T 23, or T 141, T 177, and T 23
ALL	TEMPERATURE (c)	As Needed To Control Production	T 141, and ASTM C 1064
CONTROLLED LOW-STRENGTH MATERIAL (CLSM)	AIR CONTENT FLOW COMPRESSIVE STRENGTH	As Needed To Control Production	TEST ACCORDING TO CLSM SPECIFICATION

NOTES:

(a) Sampling and testing of small quantities of curb, gutter, median, barrier, sidewalk, slope wall, paved ditch, miscellaneous items, and incidental items may be waived by the Engineer if requested by the Contractor. However, quality control personnel are still required according to “Quality Control by Contractor, (a) Personnel Requirements.” The Contractor shall also provide recent evidence that similar material has been found to be satisfactory under normal sampling and testing procedures. The total quantity that may be waived for testing shall not exceed 76 cu m (100 cu yd) per contract.

(b) If one mix design is being used for several construction items during a day's production, one testing frequency may be selected to include all items. The construction items shall have the same slump, air content, and water/cement ratio specifications. The frequency selected shall equal or exceed the testing required for the construction item.

One sufficiently sized sample shall be taken to perform the required test(s). Random numbers shall be determined according to the Department's "Method for Obtaining Random Samples for Concrete". The Engineer may observe the selection of a random number.

(c) The temperature, slump, and air content tests shall be performed on the first truck load delivered, for each pour. Unless a random sample is required for the first truck load, testing the first truck load does not satisfy random sampling requirements.

(d) The slump random sample testing frequency shall be a minimum 1/day for a construction item which is slipformed.

(e) If a pump or conveyor is used for placement, a correction factor shall be established to allow for a loss of air content during transport. The first three truck loads delivered shall be tested, before and after transport by the pump or conveyor, to establish the correction factor. Once the correction is determined, it shall be re-checked after an additional 40 cu m (50 cu yd) is pumped, or an additional 80 cu m (100 cu yd) is conveyored. This shall continue throughout the pour. If the re-check indicates the correction factor has changed, a minimum of two truck loads is required to re-establish the correction factor. The correction factor shall also be re-established when significant changes in temperature, distance, pump or conveyor arrangement, and other factors have occurred. If the correction factor is 3.0 percent or more, the Contractor shall take corrective action to reduce the loss of air content during transport by the pump or conveyor. The Contractor shall record all air content test results, correction factors and corrected air contents. The corrected air content shall be reported on Form MI 654.

(f) If the Contractor's or Engineer's air content test result is within the specification limits, and 0.2 percent or closer to either limit, the next truck load delivered shall be tested by the Contractor. For example, if the specified air content range is 5.0 to 8.0 percent and the test result is 5.0, 5.1, 5.2, 7.8, 7.9 or 8.0 percent, the next truck shall be tested by the Contractor. If the Contractor's or Engineer's air content or slump test result is not within the specification limits, all subsequent truck loads delivered shall be tested by the Contractor until the problem is corrected.

(g) The test of record for strength shall be the day indicated in the Standard Specifications. For cement aggregate mixture II, a strength requirement is not specified and testing is not required. Additional strength testing to determine early falsework and form removal, early pavement or bridge opening to traffic, or to monitor strengths is at the discretion of the Contractor. For pavement, the first and second sentences of the second paragraph of Article 701.05(c)(6) shall not apply. Strength specimens for early falsework and form removal, and early pavement or bridge deck opening to traffic shall be cured with the pavement or structure. Strength shall be defined as the average of at least two cylinder or two beam breaks for field tests.

In some instances, such as Articles 503.05 and 503.06, only a flexural strength is specified. An equivalent compressive strength may be used if approved by the Engineer.

(h) In addition to the strength test, an air test, slump test, and temperature test shall be performed on the same sample. For mixtures pumped or conveyored, the Contractor has the option to sample at the discharge end.

(i) The air content test will be required for each delivered truck load.

(j) For seal coat, the slump test shall be performed as needed to control production.

(k) For fabric formed concrete revetment mat, the slump test is not required.

SCHEDULE C

ENGINEER QUALITY ASSURANCE INDEPENDENT SAMPLE TESTING

LOCATION	MEASURED PROPERTY	TESTING FREQUENCY (a)
Plant	Gradation or Aggregates Stored in Stockpiles or Bins, Slump, and Air Content	As determined by the Engineer.
Jobsite	Slump, Air Content And Strength	As determined by the Engineer.

ENGINEER QUALITY ASSURANCE SPLIT SAMPLE TESTING

LOCATION	MEASURED PROPERTY	TESTING FREQUENCY (a)
Plant	Gradation for Aggregates Stored in Stockpiles or Bins (b)	At the beginning of the project, the first test performed by the Contractor. Thereafter, a minimum of 10 % of total tests required of Contractor will be performed per aggregate gradation number and per plant.
	Slump and Air Content	As determined by the Engineer.
Jobsite	Slump (c) and Air Content (c) (d)	At the beginning of the project, the first three tests performed by the Contractor. Thereafter, a minimum of 10 % of total tests required of Contractor will be performed per plant, which will include a minimum of one test per mix design.
	Strength (c)	At the beginning of the project, the first test performed by the Contractor. Thereafter, a minimum of 10 % of total tests required of Contractor will be performed per plant, which will include a minimum of one test per mix design.

(a) The Engineer will perform the testing throughout the period of quality control testing by the Contractor.

(b) The Engineer will witness, a minimum of one a month, the split sample obtained by the Contractor.

(c) The Engineer will witness the split sample obtained by the Contractor.

(d) Before transport by pump or conveyor, a minimum of 10% of total tests required of the Contractor will be performed per mix design and per plant. After transport by pump or conveyor, a minimum of 10% of total tests required of the Contractor will be performed per mix design and per plant.

SCHEDULE D

ILLINOIS DEPARTMENT OF TRANSPORTATION

CONCRETE QC/QA DOCUMENTS

1. Model Quality Control Plan for Concrete Production (*)
2. Qualifications and Duties of Concrete Quality Control Personnel (*)
3. Development of Gradation Bands on Incoming Aggregate at Mix Plants (*)
4. Required Sampling and Testing Equipment for Concrete (*)
5. Calibration of Concrete Testing Equipment (*)
6. Method for Obtaining Random Samples for Concrete (*)
7. Water/Cement Ratio Worksheet (*)
8. Field/Lab Gradations (Form MI 504M)
9. Concrete Air, Slump and Quantity (Form MI 654)
10. P.C. Concrete Strengths (Form MI 655)
11. Manual of Instructions for Design of Concrete Mixtures
12. Aggregate Technician Course Workbook
13. Portland Cement Concrete Tester Course Manual
14. Portland Cement Concrete Level I Technician Course Manual
15. Portland Cement Concrete Level II Technician Course Manual
16. Manual of Test Procedures for Materials

* Refer to the Manual of Test Procedures for Materials